

**What is claimed is:**

- 1                   1.       A device for use in an imaging system comprising:  
2                   a direct conversion detector element configured to convert x-ray  
3                   photons into electric current, said direct conversion detector element  
4                   comprising:  
5                   a cathode surface;  
6                   an anode surface having a plurality of anode side edges; and  
7                   a plurality of detector side surfaces connecting said cathode  
8                   surface to said anode surface, said plurality of detector side surfaces each  
9                   having a detector depth ;  
10                  a pixel array assembly positioned on said anode surface, said  
11                  pixel array assembly including a plurality of pixel side edges, each of said  
12                  plurality of pixel side edges immediately adjacent one of said anode side edges;  
13                  a guard ring mounted around said plurality of detector side  
14                  surfaces, said guard ring including an upper ring edge, a lower ring edge, and a  
15                  ring outer surface including a guard ring height.
- 1                   2.       A device as in claim 1 further comprising:  
2                   a voltage source in communication with said guard ring, said  
3                   voltage source biasing said guard ring with a bias voltage.
- 1                   3.       A device as in claim 1 wherein said upper ring edge and  
2                   said lower ring edge are remotely positioned from said cathode surface and said  
3                   anode surface.
- 1                   4.       A device as in claim 1 wherein said ring outer surface is  
2                   coplanar with said pixel side edges.
- 1                   5.       A device as in claim 1 wherein said ring outer surface is  
2                   coplanar with said plurality of detector side surfaces.

1                   6.     A device as in claim 1 wherein said direct conversion  
2     detector element comprises amorphous selenium.

1                   7.     A device as in claim 1 wherein said pixel array assembly  
2     comprises a room temperature semiconductor.

1                   8.     A device as in claim 1 wherein said direct conversion  
2     detector element comprises a CdTe detector.

1                   9.     A device as in claim 1 wherein guard ring height is 50%  
2     or less of said detector depth.

1                   10.    A device as in claim 1 wherein said upper ring edge and  
2     said lower ring edge are positioned closer to said anode surface than said  
3     cathode surface.

1                   11.    An imaging system comprising:  
2     an x-ray source;  
3     a detector array comprising a plurality of direct conversion  
4     detector elements configured to convert x-ray photons into electric current, each  
5     of said plurality of direct conversion detector elements comprising:  
6         a cathode surface;  
7         an anode surface having a plurality of anode side edges; and  
8         a plurality of detector side surfaces connecting said cathode  
9     surface to said anode surface, said plurality of detector side surfaces each  
10    having a detector depth ;  
11         a pixel array assembly positioned on said anode surface, said  
12    pixel array assembly including a plurality of pixel side edges;  
13         a guard ring mounted around said plurality of detector side  
14    surfaces, said guard ring including an upper ring edge, a lower ring edge, and a  
15    ring outer surface including a guard ring height, said ring outer surface  
16    positioned coplanar with said pixel side edges.

1                   12.    An imaging system as described in claim 11 wherein  
2                   each of said plurality of pixel side edges is positioned immediately adjacent one  
3                   of said anode side edges.

1                   13.    An imaging system as in claim 11 further comprising:  
2                   a voltage source in communication with said guard ring, said  
3                   voltage source biasing said guard ring with a bias voltage.

1                   14.    An imaging system as in claim 11 wherein said upper  
2                   ring edge and said lower ring edge are remotely positioned from said cathode  
3                   surface and said anode surface.

1                   15.    An imaging system as in claim 11, wherein said ring  
2                   outer surface is coplanar with said plurality of detector side surfaces.

1                   16.    An imaging system as in claim 11 wherein said guard  
2                   ring is coated on said plurality of detector side surfaces such that said guard ring  
3                   is substantially coplanar with said plurality of detector side surfaces.

1                   17.    A method of improving the performance of peripheral  
2                   pixel elements positioned on an anode surface of a direct conversion detector  
3                   element, the direct conversion detector element having a cathode surface and a  
4                   plurality of detector side surfaces, comprising:  
5                   applying a guard ring around said plurality of detector side  
6                   surfaces, said guard ring applied coplanar to said peripheral pixel elements.

1                   18.    A method as described in claim 17, further comprising:  
2                   applying a bias voltage to said guard ring.

1                   19.    A method as described in claim 17, further comprising:  
2                   adjusting a guard ring height of said guard ring to maximize the  
3                   performance of the peripheral pixel elements.

1                   20.    A method as described in claim 17, further comprising:

- 2                                adjusting a guard ring position along a detector depth to
- 3       maximize the performance of the peripheral pixel elements.